



Recommendations for the Use of Antiretroviral Drugs in Pregnant Women with HIV Infection and Interventions to Reduce Perinatal HIV Transmission in the United States

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Panel's Recommendations

- Plasma HIV RNA levels of pregnant women with HIV should be monitored at the initial antenatal visit (**AI**), 2 to 4 weeks after initiating (or changing) an antiretroviral (ARV) drug regimen (**BI**), monthly until RNA levels are undetectable (**BIII**), and then at least every 3 months during pregnancy (**BIII**). HIV RNA levels also should be assessed at approximately 34 to 36 weeks' gestation to inform decisions about mode of delivery (see [Transmission and Mode of Delivery](#)) and to inform decisions about optimal management for the newborn (see [Antiretroviral Management of Newborns with Perinatal HIV Exposure or HIV Infection](#)) (**AIII**).
- CD4 T lymphocyte (CD4) cell count should be monitored at the initial antenatal visit (**AI**). Patients who have been on antiretroviral therapy (ART) for ≥ 2 years and who have had consistent viral suppression and CD4 counts that are consistently >300 cells/mm³ do not need to have their CD4 counts monitored after the initial antenatal visit during this pregnancy, per the Adult and Adolescent Antiretroviral Guidelines (**CIII**). Women who have been on ART for <2 years, women with CD4 counts <300 cells/mm³, and women with inconsistent adherence and/or detectable viral loads should have CD4 counts monitored every 3 to 6 months during pregnancy (**CIII**).
- HIV drug-resistance testing should be performed in women whose HIV RNA levels are above the threshold for standard resistance testing (i.e., >500 copies/mL to 1,000 copies/mL) before:
 - Initiating ART in ARV-naïve pregnant women who have not been previously tested for ARV resistance (**AII**);
 - Initiating ART in ARV-experienced pregnant women (**AIII**); or
 - Modifying ART regimens for women who become pregnant while receiving ARV drugs or women who have suboptimal virologic response to ARV drugs that were started during pregnancy (**AII**).
- ART should be initiated in pregnant women prior to receiving results of ARV-resistance tests. ART should be modified, if necessary, based on the results of the resistance assay (**BIII**).
- Laboratory testing for monitoring of complications of ARV drugs during pregnancy should be based on what is known about the adverse effects of the drugs a woman is receiving (**AIII**).
- Women who are taking ART during pregnancy should undergo standard glucose screening at 24 to 28 weeks' gestation (**AIII**). Some experts suggest glucose screening early in pregnancy for women who are receiving protease inhibitor (PI)-based regimens that were initiated before pregnancy, in accordance with recommendations for women who are at risk for glucose intolerance (**BIII**). For more information on PIs, see [Combination Antiretroviral Drug Regimens and Maternal and Neonatal Outcomes](#).
- Amniocentesis, if clinically indicated, should be performed on women with HIV only after initiation of an effective ART regimen and, ideally, when HIV RNA levels are undetectable (**BIII**). If a woman with detectable HIV RNA levels requires amniocentesis, consultation with an expert in the management of HIV in pregnancy should be considered (**BIII**).

Rating of Recommendations: A = Strong; B = Moderate; C = Optional

Rating of Evidence: I = One or more randomized trials with clinical outcomes and/or validated laboratory endpoints; II = One or more well-designed, nonrandomized trials or observational cohort studies with long-term clinical outcomes; III = Expert opinion

Viral loads should be monitored more frequently in pregnant individuals than in nonpregnant individuals because of the importance of rapid and sustained viral suppression in preventing perinatal HIV transmission. Individuals who are adherent to their antiretroviral (ARV) regimen and who do not harbor resistance mutations to the prescribed drugs should achieve viral suppression within 12 to 24 weeks. Individuals with higher viral loads and lower CD4 T lymphocyte (CD4) cell counts are more likely to require more time to achieve viral suppression^{1,2} compared to those with lower viral loads and higher CD4 counts. In addition, those using integrase strand transfer inhibitors (INSTIs) are more likely to achieve suppression in much shorter time frames. Most patients with adequate viral response at 24 weeks of treatment have had at least a 1 log viral load decrease within 1 to 4 weeks after starting therapy.^{3,4} Viral load should be monitored in pregnant women with HIV at the initial clinic visit, 2 to 4 weeks after initiating or changing an ARV regimen, monthly until undetectable, and at least every 3 months thereafter. If adherence is a concern, especially during early pregnancy, more frequent monitoring is recommended because of the potential increased risk of perinatal HIV transmission associated with detectable HIV viremia during pregnancy.⁵⁻⁷ Similarly, pregnancy may affect the drug exposure levels or efficacy of some drugs; women who are taking these drugs may require a change in therapy or more frequent viral load monitoring (see [Table 4](#) and [Table 5](#)). **More frequent viral load monitoring is recommended for women receiving rilpivirine-based or cobicistat-boosted regimens**

(elvitegravir, atazanavir, or darunavir). Although increasing the frequency of viral load monitoring may help detect viral rebound, this may be difficult to implement if visit attendance or access to viral load monitoring is limited. In addition, viremia detected in late pregnancy may be challenging to manage, requiring medication changes shortly before delivery, see [Pregnant Women Living with HIV Who Are Currently Receiving Antiretroviral Therapy](#).

Viral load also should be assessed at approximately 34 to 36 weeks' gestation to inform decisions about the mode of infant delivery and optimal treatment for newborns (see [Transmission and Mode of Delivery](#)).

In pregnant women with HIV, CD4 count should be monitored at the initial clinic visit. For patients who have been on antiretroviral therapy (ART) for ≥ 2 years, who have had consistent viral suppression and CD4 counts that are consistently >300 cells/mm³, and who are tolerating ART in pregnancy, CD4 count should be monitored only at the initial antenatal visit; CD4 counts do not need to be repeated for these patients during this pregnancy, as per the Adult and Adolescent Antiretroviral Guidelines.^{3,8,9} Women who have been on ART for <2 years, women with CD4 counts of <300 cells/mm³, or women with inconsistent adherence and/or detectable viral loads should have CD4 counts monitored every 3 to 6 months during pregnancy. The safety of this approach is supported by research that demonstrates that patients who are stable on ART (defined as patients who have viral load levels <50 copies/mL and CD4 counts >500 cells/mm³ for 1 year) are highly unlikely to experience a CD4 count <350 cells/mm³ in the span of a year.¹⁰

HIV drug-resistance testing should be performed in women with HIV before starting or modifying ARV regimens if HIV RNA levels are above the threshold for standard resistance testing (i.e., >500 copies/mL to 1,000 copies/mL). See [Antiretroviral Drug Resistance and Resistance Testing in Pregnancy](#) for more information on resistance testing, including considerations regarding INSTI genotypic resistance testing. ART should not be delayed while waiting for resistance test results. If the results demonstrate resistance, then the regimen can be subsequently adjusted. ARV drug resistance testing should also be performed on women who are taking an ARV regimen but who have suboptimal viral suppression (i.e., failure to achieve undetectable levels of virus during an appropriate time frame, as noted above) or who have sustained viral rebound to detectable levels after prior viral suppression on an ARV regimen (see [Lack of Viral Suppression](#) and [Antiretroviral Drug Resistance and Resistance Testing in Pregnancy](#)). Drug-resistance testing in the setting of virologic failure is most useful when it is performed while patients are receiving ARV drugs or within 4 weeks after discontinuing drugs. Even if more than 4 weeks have elapsed since the ARV drugs were discontinued, resistance testing can still provide useful information to guide therapy, though it may not detect all resistance mutations that were selected by previous ART regimens.

Laboratory testing for monitoring of potential complications of ARV drugs during pregnancy should be based on what is known about the adverse effects of the drugs a woman is receiving. For example, routine hematologic monitoring is recommended for women who are receiving zidovudine-containing regimens, and routine renal monitoring is recommended for women on tenofovir disoproxil fumarate. Liver function should be monitored in all women who are receiving ARV drugs. Hepatic dysfunction has been observed in pregnant women on protease inhibitors (PIs), and [use of any PI in pregnancy has been associated with higher rates of liver function test abnormalities than seen with NNRTI-based ART](#). Hepatic steatosis and lactic acidosis in pregnancy have been related to the use of nucleoside reverse transcriptase inhibitors. Pregnant women in general are more likely to have elevated levels of liver enzymes than their nonpregnant counterparts.¹¹⁻¹³

Pregnancy increases the risk of glucose intolerance. PIs have been associated with increased risk of hyperglycemia, new-onset diabetes mellitus, exacerbation of existing diabetes mellitus, and diabetic ketoacidosis.¹⁴⁻¹⁷ However, the majority of studies in pregnant women [have not demonstrated an association between HIV infection and gestational diabetes](#),¹⁸⁻²² though some studies with stringent definitions of gestational diabetes did show an increased risk of gestational diabetes in women who were taking PI-based regimens during pregnancy.²³ Two studies reported higher odds of gestational diabetes in women who were receiving PI-based regimens,^{24,25} but another prospective study reported that pregnant women with HIV who received PI-containing regimens did not have a greater risk for glucose intolerance or insulin resistance

than women who received regimens that did not contain a PI.²⁶ Women with HIV who are on ART during pregnancy should receive the standard glucose screening at 24 to 28 weeks' gestation that is recommended for all pregnant women. However, some experts would perform glucose screening earlier in pregnancy for women who are receiving PI-based ART that was initiated before pregnancy, similar to recommendations for women with risk factors for glucose intolerance.²⁷

Accurate estimation of date of delivery is critical when planning scheduled cesarean deliveries at 38 weeks' gestation to prevent perinatal transmission in women with HIV who have elevated HIV RNA viral loads (or when scheduling cesarean delivery or induction for an obstetric indication).²⁸ Therefore, it is recommended that health care providers follow the current obstetric guidelines for gestational age dating by ultrasound.²⁹

Noninvasive methods of aneuploidy screening should be offered, using tests with high sensitivity and low false-positive rates as recommended by American College of Obstetricians and Gynecologists. Screening can be accomplished using any of the following:

- Serum analyte screening alone or combined with nuchal translucency,
- Cell-free DNA screening, *or*
- Ultrasonographic screening alone.^{30,31}

Women with HIV who have indications for invasive testing during pregnancy (e.g., abnormal ultrasound or aneuploidy screening) should be counseled about the potential risk of perinatal HIV transmission along with other risks of the procedure so that they can make an informed decision about testing. Although data for women receiving ART are still somewhat limited, the risk of perinatal HIV transmission does not appear to increase with the use of amniocentesis or other invasive diagnostic procedures in women who have virologic suppression on ART.^{32,33} This is in contrast to the era before effective ART, during which invasive procedures such as amniocentesis and chorionic villus sampling (CVS) were associated with a two-fold to four-fold increase in risk of perinatal transmission of HIV.³⁴⁻³⁷ Although no transmissions occurred among 159 reported cases of amniocentesis or other invasive diagnostic procedures performed in women who were on effective ART, a small increase in the risk of transmission cannot be ruled out.³⁸⁻⁴¹ Some experts consider CVS and cordocentesis too risky to offer to women with HIV, and they recommend limiting invasive procedures to amniocentesis.

At a minimum, pregnant women with HIV should receive effective ART before undergoing any invasive prenatal testing. In addition, they should ideally have undetectable HIV RNA levels at the time of the procedure, and every effort should be made to avoid inserting the needle through, or very close to, the placenta. If a woman with detectable HIV RNA levels requires amniocentesis, consultation with an expert in the management of HIV in pregnancy should be considered (see [Other Intrapartum Management Considerations](#)).

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